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SPACE AND TIME VARIABLES IN ESP

BY

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ABSTRACT: A survey of published ESP experiments involving distance (8) indicated a marked decline in scoring level with increasing distance between subjects and targets. In the present experiment statistically significant variations in ESP scoring were found to be associated with the four conditions used in the experiment. The essential variables of these conditions seem to be distances in space and time.

The observed between conditions variance of the ESP scores could be attributable either to objective factors, the distances in space and time, or to subjective factors, i.e., the subjects' attitude toward these variables. Analyses of questionnaire scores and of the results of Rosenzweig's Picture-Frustration Study supported the hypothesis of objective factors as the cause of the between conditions variance. Further experiments, however, are needed to reach definite conclusions.—Ed.

INTRODUCTION

There is steadily growing experimental evidence that ESP can overcome great distances in space and seemingly also in time, penetrating the future. This characteristic has aroused tremendous interest among philosophers (2, 3, 4, 9, 10, 18) and induced parapsychologists to philosophize upon it (1, 13, 19). One of us (K.O.) has discussed elsewhere (8) the pertinent literature and the methodological problems in detail. The main finding of that survey was that the ESP scores analyzed tended to decline with increasing distances between subjects and targets. The decline was not in accordance with the inverse square law of energy expansion, but followed an "inverse two-fifth's law"; that is, the scores declined by somewhat less than the inverse square root.

DESIGN OF THE EXPERIMENT

In this research an attempt was made to collect data pertinent to the problem of ESP over distances in space and time by the use of a complex experimental design. Space and time variables were used jointly because they seem to be closely related in macrophysical measurements. It thus seems reasonable to suppose that they may also affect, in a related way, the actions of the "channel factor" (8, p. 24) in ESP.

¹At the time this experiment was performed, the senior author was Research Associate at the Parapsychology Laboratory, Duke University. The junior author was President of the Finnish S.P.R. (Sällskapet för Psykisk Forskning i Finland). The research was supported in part by a grant from the Parapsychology Foundation, Inc.

A number of methodological difficulties with space and time variables have been encountered by other researchers (6, 11, 14, 17). We tried to overcome some of them by incorporating the following provisions:

In contrast to the Duke experiments with Marchesi (6, 14) or Soal's work with Mrs. Stewart (17), we chose a multiple-subject design, which is necessary to exclude idiosyncrasies in experiments where achievement levels are compared. Otherwise, the subjects' peculiarities are confounded with the variables tested.

The subjects' attitudes to the conditions compared were ascertained by means of a questionnaire (see p. 135). We arrived at three attitudinal aspects: (1) Belief or disbelief in the kind of ESP tested, (2) the subjects' confidence in their own ability in relation to the particular ESP task, and (3) their feelings while taking each of the tests. The subjects' habitual reactions to frustrating situations were tested by means of Rosenzweig's Picture-Frustration Study (15, 16).

Four types of ESP tests were used for each subject:

1. ESP over no appreciable distance (Near-Distance or ND test).
2. ESP over a distance in space of approximately 4000 miles (Long-Distance or LD test).
3. ESP over a distance in time (Precognition or Pcg₁ test).
4. ESP over a distance in space and time combined (Pcg₂ test).

These four types of ESP tests were aimed to tap two variables: distance in space and distance in time. The variables were given in two intensities: the variable present and the variable absent; that is, distance present or absent, and the time gap between guessing and target arrangement present or absent. In condition (1) both of the factors were absent. In condition (2) only the spatial distance was present. In condition (3) only the temporal distance was present. In condition (4) both factors were present. This type of experimental design is commonly called "two-by-two factorial."

The experiment was designed to shed light on the question whether space and time factors significantly influence ESP scoring and, more specifically, to test the following three hypotheses:

1. The four test conditions will influence ESP scoring level to a statistically significant extent as measured by between conditions variance.
2. The influence of the variables will be traceable to the space factor, the time factor, or interactions between them.
3. The between conditions variance will not be attributable to subjective factors, such as the subjects' reactions to the experiment and their attitudes toward the test conditions. These hypotheses will be further clarified in the sections to follow.

PROCEDURE

The duties of the two experimenters were divided in this research. J.F., located in Helsingfors, Finland, worked with the subjects. He selected them from among the members of the Finnish S.P.R., whose President he was at that time. Nearly all of the twenty-four subjects had been tested by J.F. before and had told him about their spontaneous psi experiences; it was on the basis of this information that the selection of subjects was made. J.F. administered all the ESP tests, attitude questionnaire, and the Picture-Frustration (P-F) test. He also translated the instructions and questions into the Finnish language.

K.O., at that time located at the Parapsychology Laboratory, Duke University, Durham, N. C., made the preliminary survey of the published data and designed the present experiment in close consultation with Malcolm E. Turner, Jr.² K.O.'s duties included the preparation of all the experimental material, handling of the targets, checking the records, and evaluating the results.

Twenty-four subjects took part in the experiment, each attending one individual session during which he carried out eight runs, two for each of the four conditions. Thus a total of 192 runs was performed for the entire experiment, with a different target order for each subject. After the completion of each set of two runs, the subject was given the attitude questionnaire, the P-F test was administered at the end of the experimental session.

Near-Distance or ND Test

The targets consisted of two columns of abbreviated ESP card symbols, twenty-five items in each column, inscribed on a standard printed record sheet. The target sheet was placed between two sheets of black paper and inserted in a manila envelope. K.O. then sealed the envelopes along the joints with scotch tape. A record sheet was stapled to the outside of each envelope in such a way that its columns exactly matched those of the target sheet inside. Two columns of the outer record sheet were marked to indicate to the subject where he should write his response as to the card symbol he thought was just below on the target sheet. The envelopes with the record sheets still stapled to them were returned

² Professor Turner, Chairman of the Department of Biometry, School of Medicine, Emory University, advised us on statistical problems. Drs. R. Wallin and E. Stephens translated the subjects' verbal responses from Finnish into English. The success of the experiment depended on the fine cooperation of the members of the S.P.R. in Finland. We deeply appreciate the help of all these persons.

unopened to the Duke Laboratory and all the seals were found intact.

Long-Distance or LD Test

Two columns of ESP cards, twenty-five in each column, were laid face down on a table in K.O.'s office at Duke at the appointed times. J.F.'s name, written on an index card, was placed at the top of the card columns to identify the experiment. The columns were marked with the Roman numerals I and II. K.O. sat at the table during the session. His role was meant to be merely that of a living identification mark to help the subjects locate the cards. The records of the subjects' calls were mailed to Duke, but the target records were not sent to Finland in order to safeguard against the possibility of precognition without distance.

Precognition or Pcg₁ Test

In this test the subjects had to respond to a target order which was not in existence at the time they made their guesses. The target order was created later. If the subjects were to achieve extrachance results, they would have to overcome a distance in time. They were instructed to write on the record sheet the ESP symbols they thought that the experimenter (K.O.) would later write in beside their guesses. After the experiment was finished, and the material sent to Duke, K.O. randomized the target order and inscribed it on the record sheet beside each subject's guesses. The record sheets with the inscribed targets were then mailed back to Finland and each subject had to read his target list aloud.³ It was thought that this procedure would help the subject to precognize the target without necessarily having to combine this with overcoming the factor of distance in space.

Precognition plus Long Distance or Pcg₂ Test

In this test the target order was not only created after the subjects had made their guesses; it was also kept at a long spatial distance from them. They therefore had to overcome both distance in time and distance in space to obtain extrachance results. The detailed method used here was exactly the same as that used for

³ The subjects were instructed to attempt to precognize the target order which would later be inscribed on the record sheets. However, they might have precognized their own future perception of the targets gained at the time they read them aloud from the Pcg₁ sheets. But this is a remote possibility because, during the testing, neither the subjects nor J.F. knew that they would see the Pcg₁ sheets later on. The subjects' attention was focused on the blank spaces on the record sheets and on what would later be filled in there.

the Pcg₁ tests, except that after K.O. randomized the target order and inscribed it on the record sheets he kept the sheets at Duke. Thus the subjects never had an opportunity to be in the vicinity of them, nor were they ever informed of the target order.

Target Determination for both Precognition Tests

The method of target determination for both precognition tests was similar to that described elsewhere by K.O. (7). Some slight modifications were introduced for entering the random number book. Targets were generated by "translating" the digits in the random number book into card symbols by means of a fixed code. In order to exclude the possible influence of the experimenter's clairvoyance in choices in the random number book, the following steps were taken:

K.O. threw four times by cup a set of three ten-sided dice. He recorded them and so obtained four three-digit numbers. They were then multiplied together on a calculator. This result was multiplied by its digits in the reverse order. This usually gave a number of sixteen to twenty digits. The square root of the ten digits to the left was then extracted. The first pair of digits on the right was used to determine the page in the book, the second pair to determine the column, and the third pair to determine the entry in the column. Target determination was done separately for both sets of Pcg targets. The set with the smaller square root of the target determination process was assigned to the Pcg₁ tests, in which the record sheets were sent back to Finland. The set with the larger square root was assigned to the Pcg₂ tests, in which the record sheets were kept at Duke and never seen by the subjects.⁴

The four types of ESP tests could be arranged in twenty-four combinations, e.g., ND, Pcg₂, LD, Pcg₁, etc. These twenty-four combinations were randomized and assigned to the subjects according to the alphabetical order of their names.

The Questionnaire

A questionnaire designed to ascertain the subjects' attitudes toward the three types of ESP tests was administered after each group of two runs.⁵ The wording was slightly changed to adapt it to each condition. The following questionnaire for the ND condition is a representative example:

⁴ For further details about randomization procedures, see references 5 and 7.

⁵ An exploratory questionnaire was also administered after the completion of the first two runs. In it the subject was asked about his interest in parapsychology as expressed by reading books and articles about it, his reasons for taking part in the experiment, spontaneous cases experienced by him or members of his family, etc. Since the findings from this questionnaire are not taken into account in the statistical evaluations of the data, it will not be described in detail.

CLAIRVOYANCE TEST

- A. Do you think some people are able to obtain information by clairvoyance?
 Sure about it—, this is a possibility—, it might be so or not—, it seems unlikely—, it is impossible—.
- B. Do you believe that you are sometimes able to get some impressions by means of clairvoyance?
 Sure about it—, this is a possibility—, it might be so or not—, it seems unlikely—, it is impossible—.
- C. Do you feel that you might have been able to get some clairvoyant impressions of the cards in the present experiment?
 Sure about it—, this is a possibility—, it might be so or not—, it seems unlikely—, it is impossible—.
- D. How did you feel during the clairvoyance tests?
- E. Was there anything unpleasant in taking the tests?
- F. What was your feeling when you had to go and do the clairvoyance test?
 Eager to do it—, felt it a pleasant task—, was indifferent to it—, felt a trifle bothered by it—, disliked doing it—.

Question A was aimed at the subject's general belief that ESP could occur under the particular test condition (ND, LD, Pcg₁, or Pcg₂). Questions B and C were intended to measure the personal aspirations of the subject. The last three items related to his feelings, or emotional attitude, during the tests. D and E were designed as open-ended questions since emotional attitudes are difficult to rate quantitatively.

K.O. scored the questionnaires without knowledge of the subjects' ESP scores. Items A, B, C, and F were scored on a scale of 0 to 4 points. Zero was given for a check on the last alternative, and one point was added for each step toward acceptance. Questions D and E were scored according to K.O.'s ratings. The range for D was 0 to 4, but for E, 0 to -5.

Rosenzweig's Picture-Frustration Study (P-F)

This test consists of a booklet with twenty-four drawings expressing frustrating situations. In a "balloon" over the head of one character a sentence is printed. In another "balloon" the subject has to write the answer of the other character involved in the situation. The test is designed to ascertain how individuals habitually function in frustrating situations. We thought that some of the test conditions (long distance ESP and precognition) might prove quite frustrating to some of the subjects. Such frustration might influence the ESP scores; for example, by lowering them in

the LD and Pcg conditions. If this occurred, one might interpret it as an effect of distance when in fact it was not. We wanted to separate the subjects who habitually show little concern for obstacles from those who become upset over them. One of Rosenzweig's scoring categories, Obstacle Dominance, was selected as the most appropriate for our purposes.

The test was administered by J.F. and scored by K.O. according to the standard procedure (15, 16), while subjects' names were concealed by paper strips glued over them.

RESULTS

Under some ESP test conditions, the hits are concentrated directly upon the target for which the call was intended; there is no displacement. Under other conditions, there is a tendency to displacement; i.e., the subject calls the card just before or just after the target card. In the present experiment we anticipated that the main effect might occur in terms of displacement; accordingly, the data were checked⁶ for direct hits (0), for backward displacement (-1), and for forward displacement (+1). The results of this check showed that the main effect occurred in terms of backward displacement (Table 1). It is marginally significant

TABLE 1

TOTAL DEVIATIONS OF THE THREE ESP MEASURES
 UNDER THE FOUR TEST CONDITIONS, 48 RUNS IN EACH

Kinds of ESP Measures	ND		LD		Pcg ₁		Pcg ₂		χ^2 CR ₁ , 4 d.f.	P
	Dev.	CR	Dev.	CR	Dev.	CR	Dev.	CR		
0	-6	43	-10	72	-5	36	+8	58	1.17	.88
-1	-25.4	1.87	-34.6	2.55	+21.6	1.39	-13.4	.99	13.51	.009
+1	-20.6	1.52	-91.4	.84	-27.4	2.02	+4.6	.34	7.21	.12

($\chi^2 = 13.51$, 4 d.f.) if one estimates the variation between conditions⁷ in a crude way by the chi-square test. The smallest deviations from the chance line result from direct hits on the target. There are larger but not significant deviations on the forward displacement. An inspection of Table 1 gives the impression that if ESP occurred, it was dispersed under all four of the conditions. Comparisons, therefore, are clearly out of reach of simple statistical methods.

The original plan had been to evaluate the results by the analysis-of-variance method. However, our statistical adviser,

⁶ This was carried out by K.O. and rechecked by another member of the Duke Parapsychology Laboratory staff.

⁷ "Conditions" refers to the four types of ESP tests (ND, LD, Pcg₁, and Pcg₂) described on p. 134.

Professor Turner, suggested that we use multivariate analysis of variance. This is a complex analysis where the variance of all three measures (0, -1, +1) is included after a proper adjustment for interdependency among them. It is an over-all evaluation which excludes the possibility of errors by selecting among the three types of measures (0, -1, +1). All the data have been transformed by the arc sin transformations method in order to conform to the requirements of normal distribution for analysis of variance.

The first column of Table 2, marked "0," gives the evaluation of direct hits. All variances are very close to the error variance level. Apparently ESP did not manifest itself in this experiment in terms of direct hits. The next column, "-1," is an evaluation of backward displacement scores. The difference between conditions is significant ($3P = .01$). The same trend is expressed in the third column, "+1," which gives the evaluation of forward displacement. Only the between conditions variance markedly departs from the error variance, but not significantly so. When the between conditions variance is split into individual degrees of freedom, the interactions between distance and precognition factors turn out to be the sole contributors in both displacement columns.

The results of all three measures (0, -1, +1) are taken together in the statistic called "Wilks' Criterion." The associated probabilities are given in the last column of Table 2. The trends are practically the same as in the analysis of backward and forward displacement scores. There is a significant difference between ESP scores in the four conditions used which is concentrated at the interactions between the space and time variables. The subjects responded uniformly to these variables as expressed in the small interactions variance ($P = .5$) between subjects and conditions.

The multivariate analyses of variance described above form the backbone of our evaluations and their results are the main findings. All of the following evaluations are merely attempts to ascertain whether the main findings can be explained by variables other than distance in space and time.

It was determined from the beginning to use only the most significant of the three ESP measures (0, -1, +1) for assessment in relation to the attitude questionnaire and the Picture-Frustration Study. Evaluation by the chi-square method, as indicated in Table 1, clearly indicated that backward displacement was the choice. (A combined analysis of the three ESP measures together with three independent variables (two attitude categories and a P-F category) might have been possible, but it would have made too many demands upon the statistical skills and the time allowances of the senior author.)

TABLE 2
MULTIVARIATE ANALYSIS OF VARIANCE OF THE THREE ESP MEASURES (0, -1, +1)
UNDER THE FOUR TEST CONDITIONS†

Source of Variation	d.f.	Sum of Products Matrix					Wilks' Criterion	P
		0††	-1††	+1††	0 × -1	0 × +1	-1 × +1	
Conditions	3	66.249	553.538**	275.773	160.244	64.564	330.795	.015*
Distance vs. no distance	1	2.284	41.608	.569	-9.748	-1.140	4.865	.5
Pcg. vs. no Pcg.	1	17.788	.565	62.620	3.172	-33.375	-5.951	.5
Distance × Pcg.	1	46.178	511.364***	212.584	153.667	99.079	329.709	.0007***
Subjects	23	1,283.294	727.617	933.512	23.838	-108.637	14.860	.35
Subjects × conditions	69	3,477.255	1,661.516	2,745.964	-565.697	57.081	-576.857	.5
Subjects within conditions (error)	96	4,146.682	3,649.943	3,403.368	-225.052	-116.734	-188.059	
Total	191	8,973.481	6,592.614	7,358.618	-927.155	-103.725	1,080.851	

† Sums of products were rounded for sake of convenience in presentation; hence, they will not add up exactly to the totals.
†† In the columns "0," "-1" and "+1" the significance levels are based upon 3P, which is the adjustment for selection of three possible measures.

* Significant at the .02 level.

** Significant at the .01 level.

*** Significant at the .001 level.

The next step was to evaluate the main scores of the attitude questionnaire:

1. Subject's belief in the existence of ESP of the particular types tested, i.e., "sheep-goat" attitude.
2. Subject's aspiration level or confidence in his own ability concerning the four types tested.
3. Subject's emotional attitudes during each test.

On attitude measure No. 1, almost all the subjects turned out to be "extreme sheep" for all four tasks. There was only one "moderate sheep" answer for each of the tasks. The between conditions variance is negligible and will not be considered in further evaluations. One can infer from these scores that J.F. was highly successful in selecting a homogeneous group of subjects.

There was greater variation among attitude measures Nos. 2 and 3. Separate tests of analysis of variance were performed for each of them (Tables 3 and 4). There are highly significant

TABLE 3

ANALYSIS OF VARIANCE OF ATTITUDE SCORES CONCERNING SUBJECTS' CONFIDENCE IN THEIR OWN ESP UNDER THE FOUR TEST CONDITIONS

Source	d.f.	S.S.	M.S.	F	P
Between Conditions	3	172.6055	57.5352	1.30	> .2
Distance vs. no distance	1	5.6551	5.6551		
Peg. vs. no Peg.	1	151.2526	151.2526		
Distance x Peg.	1	15.6978	15.6978		
Between subjects	23	13,389.7985	582.1652	13.12	< .001
Subjects x conditions	69	3,062.5584	44.3849		
Total	95	16,624.9624			

TABLE 4

ANALYSIS OF VARIANCE OF ATTITUDE SCORES CONCERNING SUBJECTS' EMOTIONAL ATTITUDES UNDER THE FOUR TEST CONDITIONS

Source	d.f.	S.S.	M.S.	F	P
Between Conditions	3	328.3480	109.4493	1.28	> .2
Distance vs. no distance	1	150.8261	150.8261		
Peg. vs. no Peg.	1	162.6302	162.6302		
Distance x Peg.	1	14.8916	14.8916		
Between subjects	23	5,495.0197	238.9139	2.80	< .001
Subjects x conditions	69	5,884.0010	85.2754		
Total	95	11,707.3687			

variations between individual subjects' responses in respect to both measures ($P = .001$). However, there is only a negligible variance on the most relevant between conditions item, i.e., whatever the subject's attitude level was (high or low on K.O.'s rating scale), it was nearly the same for all four tasks. In regard to this very low between conditions variance, we were advised to drop the analysis of covariance, which was originally intended for removing the attitude factor from the analysis of ESP scores. There was nothing of significance to be removed. For the sake of extreme caution, however, we applied the test. The influence (if any) of attitude factors in relation to the backward displacement scores was removed by means of an analysis of covariance (Table 5). This procedure increased slightly the significance of the main measurement: between conditions variance ($3P = .001$). However, the main findings remained unchanged.

TABLE 5

ABBREVIATED TABLE OF ANALYSIS OF COVARIANCE, PERFORMED TO REMOVE INFLUENCE OF ATTITUDE FACTORS FROM BACKWARD DISPLACEMENT SCORES

Source	d.f.	Unadjusted M.S.	Adjusted M.S.	F	3P
Between conditions	3	184.5127	178.6234	7.32	.001
Between subjects	23	31.6355	31.7325		
Subjects x conditions	69	24.0799	24.3883		

It was decided in advance to use only the measure of Obstacle Dominance (O.D.) from the Picture-Frustration Study for the main analysis. The rest of the scores on this test do not bear directly on the hypothesis in question, i.e., subjects' frustration caused by the (psychological) obstacles of distance in time and space might by itself explain the results of the experiments.

The subjects were separated into two groups: "high O.D. group," with scores higher or at the mean level of this experiment; and "low O.D. group," with scores below the mean level. The low O.D. group is supposed to be less concerned with frustrating obstacles than the high O.D. group, and we assumed that the former group would also be less frustrated and subjective about the distance (in time and space) factors in this experiment than the latter group. Analyses of variance of the -1 ESP scores were carried out separately for each group (Tables 6 and 7). In the high O.D. group (Table 6), no mean square exceeds the level of the error variance; i.e., there are no indications of extrachance effects. Analysis of the low O.D. group (Table 7) shows a pattern very similar to that of the same kind of analysis of variance of the

TABLE 6

ANALYSIS OF VARIANCE OF BACKWARD DISPLACEMENT SCORES
IN THE HIGH OBSTACLE DOMINANCE GROUP

Source	d.f.	S.S.	M.S.
Between conditions	3	98.0119	32.6706
Distance vs. no distance	1	30.4675	30.4675
Pcg. vs. no Pcg.	1	.9138	.9138
Distance $\times$ Pcg.	1	66.6308	66.6308
Between subjects	9	138.8048	15.4228
Subjects $\times$ conditions	27	764.4839	28.3142
Within subjects, within conditions	40	1,444.2997	36.1075
Total	79	2,445.6003	

TABLE 7

ANALYSIS OF VARIANCE OF BACKWARD DISPLACEMENT SCORES
IN THE LOW OBSTACLE DOMINANCE GROUP

Source	d.f.	S.S.	M.S.	F	3P
Between conditions	3	533.2069	177.7356	4.51	.02
Distance vs. no distance	1	14.2929	14.2929		
Pcg. vs. no Pcg.	1	3.2130	3.2130		
Distance $\times$ Pcg.	1	515.7010	515.7010		
Between subjects	13	584.7261	44.9789		
Subjects $\times$ conditions	39	819.3512	21.0090		
Within subjects, within conditions	56	2,205.6436	39.3865		
Total	111	4,142.9278			

total data of all subjects (Table 3). Apparently all the extrachance scoring of this experiment came from the low O.D. group, which is less concerned with frustrating situations, and therefore also presumably less concerned with the frustrating obstacles of space and time.

DISCUSSION

We consider that this experiment was sufficiently safeguarded against the usual alternative hypotheses to ESP, such as sensory leakage, checking and computational errors, etc.

The results give us a rather clear-cut answer to our first hypothesis: The four test conditions used in the experiment will influence to a statistically significant extent the ESP scoring level. This hypothesis was tested by the over-all between conditions variance, which was significant ($P = .015$) as shown in Table 2.

The factorial design of this experiment made it possible for us to ask the following question: If there is a significant between conditions variance, is it attributable to the factor of space, to that of time, or to the interactions between both? The three factorial items in Table 2 (Distance versus No Distance, Pcg versus No Pcg, and Distance interacting with Pcg) show a clear pattern. All the extrachance variance is contributed by the interaction between the space and time variables as measured in this experiment. This is significant.

However, this finding should not lead us to make sweeping generalizations. The statistical certainty of test measurements and the certainty of the generalized interpretations desired are often only loosely connected. One can never be sure from a single experiment that the factors supposedly tested are the only contributors to the between conditions variance. The possibility remains that there are other important differences between the conditions used than the space and time variables. We did not recognize any of these differences; only other experiments using the same variables, but with modified conditions, could make the exclusion sufficiently certain.

The factorial part of this experiment is complicated by indications that under some conditions the subjects did extrachance hitting of the targets and under other conditions avoided them (Table 1); in other words, there was evidence of psi-hitting and psi-missing (12). It is obvious that the strength of the ESP effect does not depend solely on the absolute number of hits under the conditions compared, but also on their relation to what is expected by chance alone. In our analysis of variance, the variation is counted from the obtained mean and not from chance expectation. So far as we know, this does not complicate any other but the factorial items in the analysis of variance table (Distance versus No Distance, Pcg versus No Pcg, Distance interacting with Pcg). The factorial items do not necessarily indicate the efficiency of ESP, e.g., that ESP effects are strong when one factor is absent, and weak when it is present; all they can tell us is which factors cause the differences in scoring levels in terms of absolute numbers, and whether the factors have independent or joint effects.

Let us give some illustrations. Suppose that all four measures are above chance expectation. The factor associated with the two largest measures will either facilitate ESP or be irrelevant to it; the factor associated with the two smallest measures will either be irrelevant or hindering. These relations would be reversed if all four measures were smaller than chance expectation. If one pair of measures is far above chance expectation and the other pair the same distance below chance expectation, then both factors will be

associated with ESP effects of the same strength regardless of the large difference in the number of hits.

The most relevant question about the data of this experiment is that concerning the twofold nature of the variables. Is the observed influence of the four test conditions attributable to the space and time variables *as such*, or to the subjects' emotional attitudes toward them?

The attitude factors, so far as the questionnaire measured them, seem to have been surprisingly unimportant. When we removed their influence from the backward displacement evaluations, the between conditions variance changed very little (Table 5). It looks as though the subjects did not discriminate between the four conditions, but reacted either to the problem of ESP in general or to the testing situation throughout the session. This is inferred from the low level of between conditions variance of the attitude measures (Tables 3 and 4). It is true, of course, that our attitude test was not validated, nor retest reliability ascertained. However, we have no reason to doubt its adequacy, although there might be some hidden uncertainties.

There were some factors which tended to counteract the formation of biased attitudes. During the experiment neither the subjects nor the experimenter (J.F.) knew which of the Pcg tests would involve the space and time variables combined. Moreover, the subjects were told that, according to the leading authorities in the field, ESP works equally well under all four conditions.

The same problem is illuminated from a different angle by the results of the Picture-Frustration Study. Independent measures could validate or, to a certain extent, invalidate each other. As mentioned above, the subjects were separated according to their scores into the high and low Obstacle Dominance groups. According to Rosenzweig (15, 16), subjects with high O.D. scores have strong subjective reactions to frustrating obstacles. We expected our subjects to be prone to subjective reactions in relation to the obstacles of spatial and temporal distances in the experiment. If the obtained effects of space and time variables on ESP in our experiment were merely of a subjective nature, they should have been more pronounced in the high O.D. group.

The low O.D. group (according to the rationale of the P-F test) consists of subjects who are less concerned with frustrating obstacles; i.e., distances in this case. If the between conditions variance was mainly contributed by this group, it would suggest objective factors as a cause; i.e., the space and time variables themselves rather than the subjects' attitude toward them.

Tables 6 and 7 give a surprisingly clear answer: the entire between conditions variance, which exceeds the error level, is

contributed by the subjects in the low O.D. group. This supports the findings of the analysis of attitudes that we have tapped the objective factors—space and time—in this experiment.

The results of this experiment indicate that the P-F test can separate "objective" subjects (useful for research in which objective variables are compared) from "subjective" ones whose scores merely reflect emotional attitudes. Thus the P-F test might make a valuable tool for all comparisons where subjects' attitudes could shape the results, not only in parapsychological experiments, but also in other branches of psychology.

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